Session 131

CarbonLib: Carbon on Mac OS 8 & 9

Mark Turner
Carbon Technology Manager

What You'll Learn

- What is CarbonLib and why is it important?
- CarbonLib versions and API availability
- Getting started with Carbon development
- Runtime issues and other considerations
- Tips, tricks, and gotchas
- Future directions

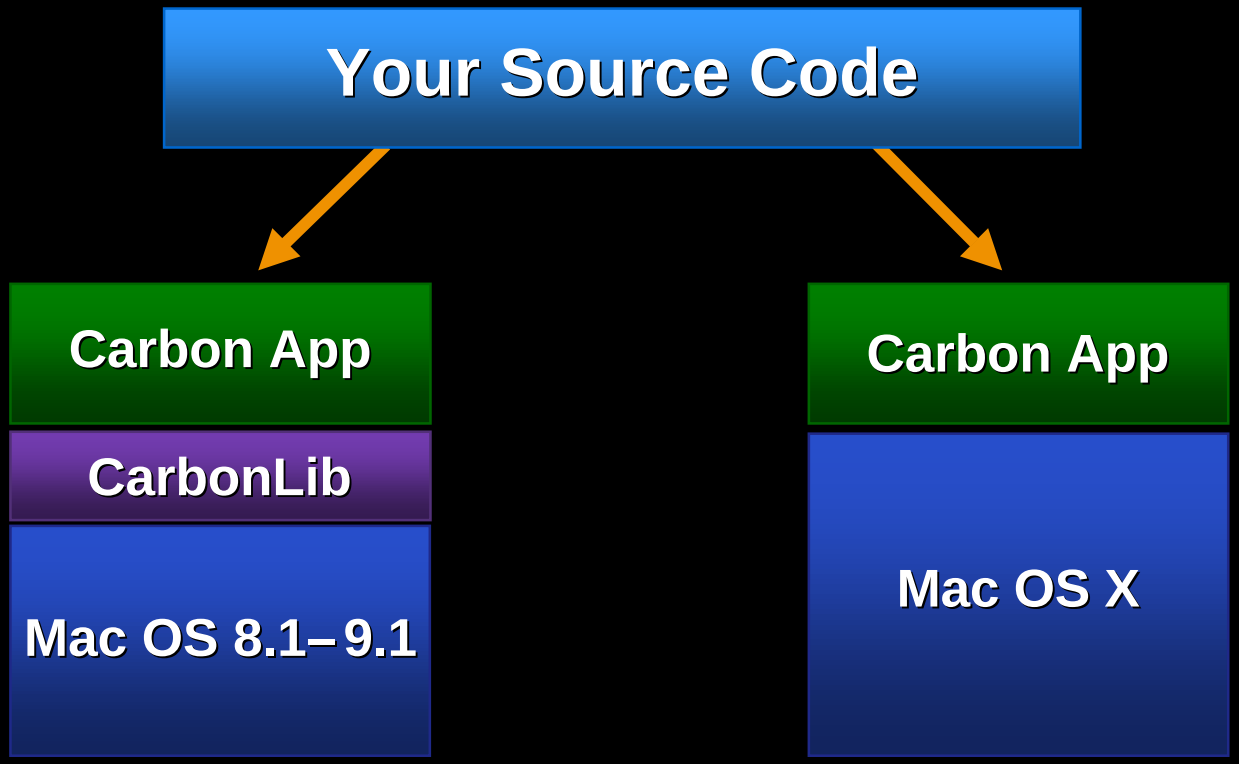
What Is CarbonLib?

- System extension that implements the subset of Carbon APIs that are available on Mac OS 8 and 9
  - Combination of glue code and new implementations
  - The library your application runs against

Why CarbonLib?

- Allows developers to tune up their applications for Mac OS X and still run on Mac OS 8 and 9
- A single source solution
- A single binary solution

Write Once, Run Everywhere



CarbonLib Versions

- Two versions available
  - CarbonLib 1.0.4
  - CarbonLib 1.3.1
- Download from

  http://developer.apple.com/sdk

CarbonLib 1.0.4

- Basic set of Carbon APIs
- For use on Mac OS 8.1 only
- Corresponds to Universal Interfaces 3.3.2

CarbonLib 1.3.1

- Current GM release
- Rich set of Carbon APIs
- Supports Mac OS 8.6 and later
- Self localizing
  - US and International English, French, German, Japanese, simplified and traditional Chinese, Dutch, Italian, Spanish, Swedish, Finnish, Norwegian
- Recommended for shipping your software
- Corresponds to Universal Interfaces 3.4

CarbonLib Licensing

- No license fee
- Standard Software Distribution Agreement, plus CarbonLib Addendum
- CarbonLib 1.3.1 license includes Apple Help 1.6.3 for use on Mac OS 8.6
- CarbonLib 1.0.4 license includes Nav Services 1.0.1 for use on Mac OS 8.1

API Support—CarbonLib 1.0.4

Mac OS 8.1–Mac OS X

- All Carbon-compatible APIs that existed in Mac OS 8.1
- Toolbox accessor functions
- Control, window, and menu properties
- Navigation services
- Core foundation
- Carbon printing

API Support—CarbonLib 1.3.1

Mac OS 8.6–Mac OS X

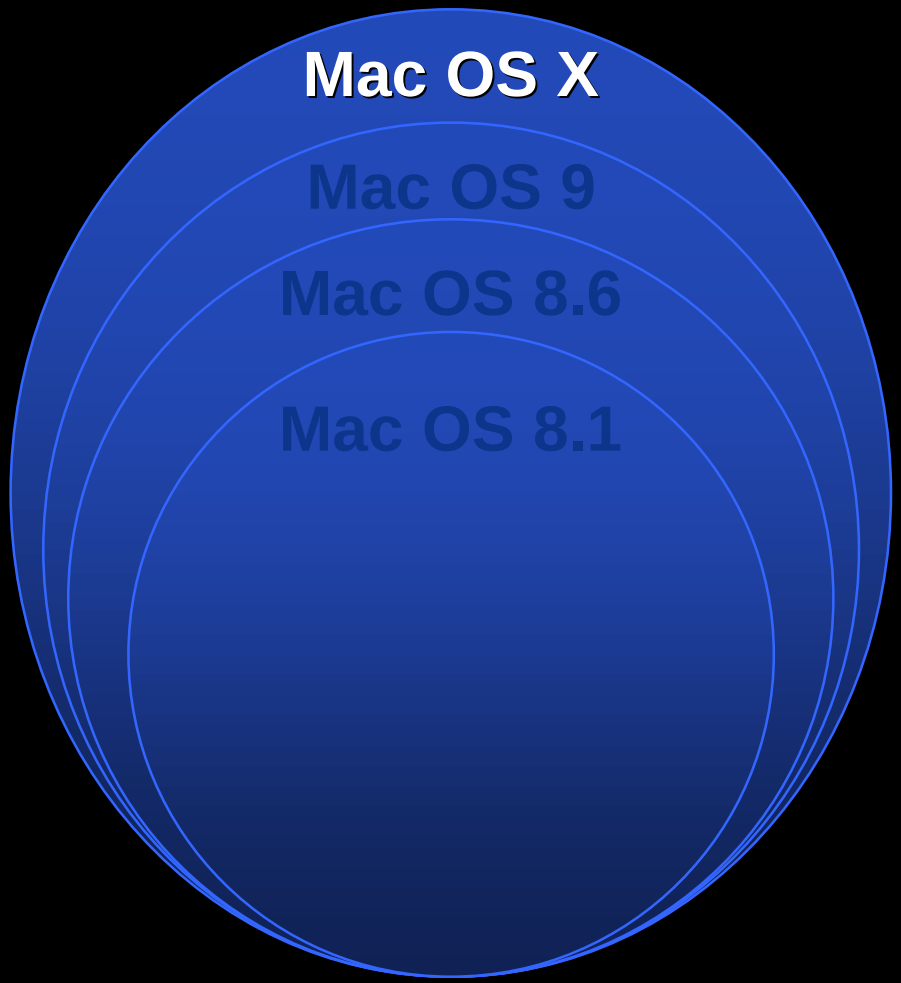
- Carbon Event Manager
- Appearance Manager 1.1
- IB Carbon Runtime
- Data Browser
- MLTE
- ATSUI
- FontSync
- URL Access
- XML Services
- HTML Rendering
- Keychain Manager
- Apple Help Viewer

API Support—CarbonLib 1.3.1

Mac OS 9–Mac OS X

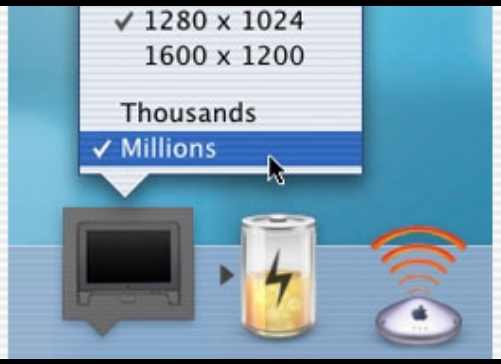
- HFS Plus APIs
- Performance and stability enhancements

Carbon on Mac OS X



- Aqua
- New Carbon APIs
- Access to other Mac OS X APIs

Getting Started



Carbon Porting in a Nutshell

1. Download the CarbonLib SDK
2. Read the Carbon Porting Guide
3. Run Carbon Dater on your app
4. Adopt replacements for non-Carbon APIs
5. Aquify your interface

1) CarbonLib 1.3.1 SDK

- CarbonLib and DebuggingCarbonLib extensions
- Stub libraries
- Universal interfaces 3.4
- Documentation
- Sample code
- Apple Help Viewer 1.6.3

2) Carbon Porting Guide

INSIDE CARBON

Carbon Porting Guide

For Mac OS X

December 2000

3) Carbon Dater

- Preview required changes
  - Drag your app onto Carbon Dater
  - E-mail resulting file to Apple
  - Receive HTML report in about an hour

http://developer.apple.com/macosx/carbon/dater.html

Carbon Dating Think different.

Home Page | Carbon Specification

Carbon Compatibility Report

Report for: My App

File Creator: myap

File Type: APPL

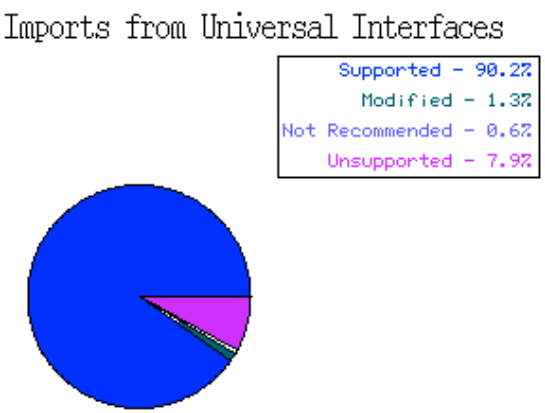
Report date: 5/20/01

Data gathered by analyzer version: 1.3

Data gathered on: 5/20/01

Summary

Test	Number
Analysis of Imports	
Supported API	469
Supported with Modifications	7
Supported But Not Recommended	3
Unsupported API	41
Analysis of Access to Low Memory Addresses	
Analysis of Resources Loaded into System Heap	



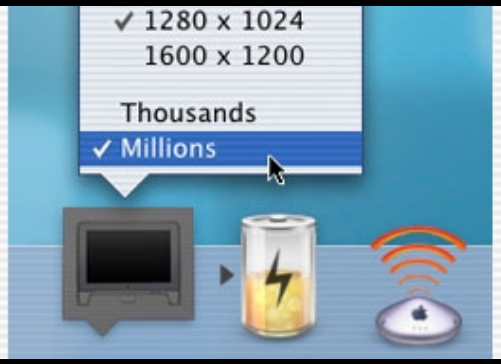
4) Adopt Supported APIs

- Navigation Services replaces Standard File
- Carbon Printing Manager replaces classic printing
- Apple Help Viewer and Help Tags replace Apple Guide and Balloon Help
- Others as needed

5) Aquify!

- Create high quality icons
- Adopt system appearance
- Follow Aqua layout guidelines
- Adopt Sheets APIs

Documentation



Documentation

- Header files
- Carbon Specification
- Carbon Porting Guide
- Tech Note 2003: Moving Your Code to Mac OS X

http://developer.apple.com/technotes/tn/tn2003.html

Carbon Specification

- Lists all APIs in Universal Interfaces
  - Carbon inclusion status
  - Version availability
  - Alternatives for unsupported APIs

http://developer.apple.com/techpubs/macosx/carbon

Carbon Specification

Back Forward Stop Refresh Home AutoFill Print Mail

Address: http://developer.apple.com/techpubs/macosx/Carbon/CarbonSpecification/Memory_Manager.html go

Favorites History Search Scrapbook Page Holder

Unsupported `MaxMemSys`

Not available in Carbon.

Supported `MemError`

Available in Carbon 1.0.2 and later when running Mac OS 8.1 or later.

Supported `MoreMasterPointers`

Carbon applications should use this function instead of `MoreMasters` to allocate a nonrelocatable block of master pointers in the current heap zone. Available in Carbon 1.0.2 and later when running Mac OS 8.1 or later.

Not Recommended `MoreMasters`

You should instead use `MoreMasterPointers`. Available in Carbon 1.0.2 and later when running Mac OS 8.1 or later.

Supported `MoveHHi`

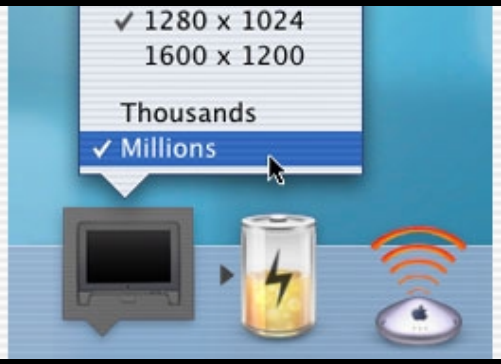
Available in Carbon 1.0.2 and later when running Mac OS 8.1 or later.

Internet zone

Additional Documentation

- Learning Carbon book from O'Reilly
- Carbon Development Tips and Tricks
  http://developer.apple.com/carbon/tipsandtricks.html
- Carbon Developer Home Page
  http://developer.apple.com/carbon

Runtime Issues



Create a 'plst' Resource

- Required for Mac OS X compatibility
- Maintain your 'vers', 'open', 'FREF', 'BNDL', and 'kind' resources for compatibility with Mac OS 8 and 9
- Documented in Tech Note 2013
  http://developer.apple.com/technotes/tn/tn2013.html

Test for API Availability

- Continue to use Gestalt to test for base functionality
- Use T-vector test to determine availability of specific APIs
- Don’t rely on CarbonLib version to determine API availability

Accessing Non-Carbon APIs

- Available through InterfaceLib
  - **GetSharedLibrary**
  - **FindSymbol**
- See example on Carbon tips and tricks page
  - **http://developer.apple.com/carbon/tipsandtricks.html**
- Use sparingly!
- Be sure to verify the OS version first
  - InterfaceLib does not exist on Mac OS X

Memory Management

- Mac OS X provides virtually unlimited address space
  - Don't be greedy—use only what you need
  - FreeMem returns a meaningless value
  - GrowZoneProc is never called
- Memory management unchanged on Mac OS 8 and 9
  - Zones still supported
  - Plug-in architectures continue to work

RAM Footprint

- Carbon applications require more memory
- You may need to adjust stack and heap requirements
- Test!

Plug-Ins

- Carbon apps can load and run non-Carbon plug-ins
- Non-Carbon apps cannot load and run Carbon plug-ins

Carbon Events

- Simplifies your code
- Improves performance
- Events are dispatched directly to windows and controls rather than your event loop
- Eliminates the need for null events

Mouse Tracking

- Avoid polling!
- Inefficient

```
GetMouse(&location);
while (StillDown())
{
...
GetMouse(&location);
}
```

Mouse Tracking

- Use TrackMouseLocation instead
- Efficient

```
TrackMouseLocation(curPort,&location,&result);
while (result !=kMouseTrackingMouseReleased)
{
...
TrackMouseLocation(curPort,&location,&result);
}
```

WaitNextEvent

- Full sleep time is respected unless an event arrives for your application
  - 6 ticks = 6 ticks
- Be sleepy!
  - Don't use small sleep times to get frequent idle time
  - Use Carbon event timers instead of null events or polling

Application Packaging

- Provides a better user experience
  - Easy installation and removal
  - Supports Mac OS X localization
  - Works on all file systems
  - Single package can contain multiple binaries
- Limited implementation available now
  - See Technical Note 1188: “Packages in Mac OS 9”
  - **http://developer.apple.com/technotes/tn/tn1188.html**
- More comprehensive support coming

Special Guest

Vince Parsons
Adobe Acrobat Engineering

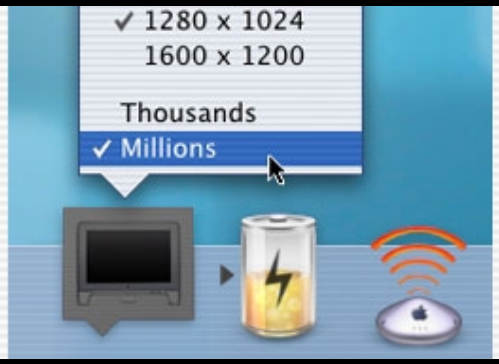
Carbonlib From the Trenches

Tips, Tricks, and Gotchas

Why We Used CarbonLib

- Minimize source code divergence
- Ease debugging of Carbonized code
  - CodeWarrior on Mac OS 9 is more mature
  - DebuggingCarbonLib
- CarbonLib goodies
  - CoreFoundation, MLTE, Carbon Events

The Tips



Runtime Differences

- Menu layout
  - Quit, Preferences—gestaltMenuMgrAquaLayoutBit
  - Help—HMGetHelpMenu
- Window attributes
  - kWindowNoShadowAttribute—gestaltWindowNoShadowBit
  - kWindowLiveResizeAttribute—gestaltWindowLiveResizeBit
- Memory management
  - Handles, TempMem—gestaltMemoryMapSparse

Calling Outside of Carbon

- Calling Mac OS X-only APIs
  - See CallMachOFramework sample on the CarbonLib SDK
  - CoreGraphics
  - I/O Kit
- Calling Mac OS 8 and 9-only APIs
  - GetSharedLibrary(InterfaceLib), FindSymbol
  - Patching Traps
  - Heap Zones

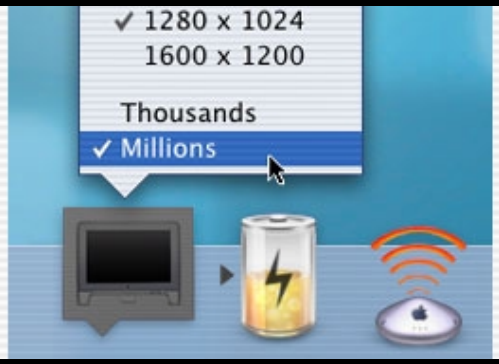
Drawing Text

- DrawString, DrawText
  - Works everywhere, but not anti-aliased text on Mac OS X
- DrawThemeTextBox
  - Preferred API to use with Mac OS X
    - Draws anti-aliased using CoreGraphics
  - Simplifies font and encoding issues by using CFString
  - Available in CarbonLib 1.3.1

Dealing With Plug-ins

- CarbonLib apps can use InterfaceLib plug-ins, with caveats
  - Plug-in windows may be created in wrong layer
    - InterfaceLib's NewCWindow creates document class windows
    - Use SetWindowClass/SetWindowGroup to fix window layer
  - Carbon events and timers may be dispatched at unexpected times
    - Any call to WaitNextEvent in a plug-in may cause Carbon event handlers or Carbon timers to be called

The Tricks



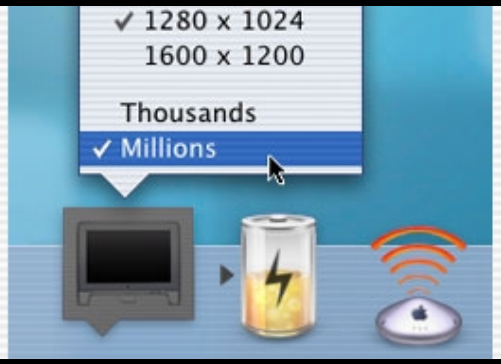
CFString-Based APIs

- Create Controls, Windows, Menus, etc.
- Allows UI code to be font agnostic
- Simplifies multi-lingual interfaces that use language kits
- Limitations on Mac OS 9 and earlier
  - Menu and window titles are system font
  - Limited to 255 bytes (Pascal strings)

CreateWindowFromNib

- Works on Mac OS 8.6 and later
- Much easier than DLOG/DITL
  - Interface Builder can import your existing DLOGs
- Native support for new control types
- Requires an external nib file (package)
  - Can't embed as a resource
- See Converter_nib sample on CarbonLib SDK

The Gotchas



Mac OS X-Only APIs

- Do not assume that Mac OS X-only APIs will stay that way
  - Be aware that APIs you tested only on Mac OS X may start being called on Mac OS 9
- Mac OS X APIs have migrated into CarbonLib
  - GetApplicationTextEncoding added in 1.2
  - DrawThemeTextBox added in 1.3.1
  - More in the future

Avoid gestaltCarbonVersion

- 1.3 != 1.3
- Use other, narrower Gestalt checks
- Check for unresolved functions
- If you must check gestaltCarbonVersion, always combine with gestaltSystemVersion
- Check for required minimum CarbonLib version at launch

Resource Chain Management

- Carbon provides APIs for resource chain modification
  - InsertResourceFile, DetachResourceFile, etc.
- Use these wisely
  - Set up your chain once, don't shuffle it constantly
- Avoid modifying the resource chain in a Carbon event handler or a Carbon timer if it might be called within Navigation Services
  - A bug in Nav Services on Mac OS 8.6–9.1 will cause your resource chain to become corrupted if your handler or timer changes the chain during Nav's call to WaitNextEvent

Things Mac OS X Does for You That CarbonLib Doesn't

- CreateRootControl
  - If you want to use control embedding, you must call CreateRootControl on Mac OS 9
- IdleControls
  - If you want your chasing arrows or indeterminate progress bar to move, put a call to IdleControls in a Carbon timer

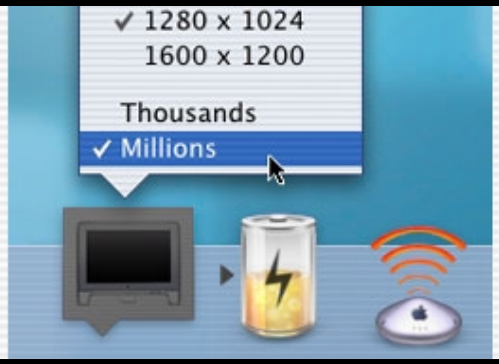
Printing

- Carbon Printing APIs are wrappers for older Print Manager APIs (mostly PrGeneral calls)
- Use Session APIs if possible
- Write printing code for Mac OS X first
  - Mac OS X is far pickier about order and usage
  - Once it works on Mac OS X, it'll probably work on Mac OS 9
- Not all drivers are fully compatible
  - Some features ignored (reverse order, invert, etc.)
  - Some drivers don't print color
  - Apple is working with printer vendors to resolve these issues

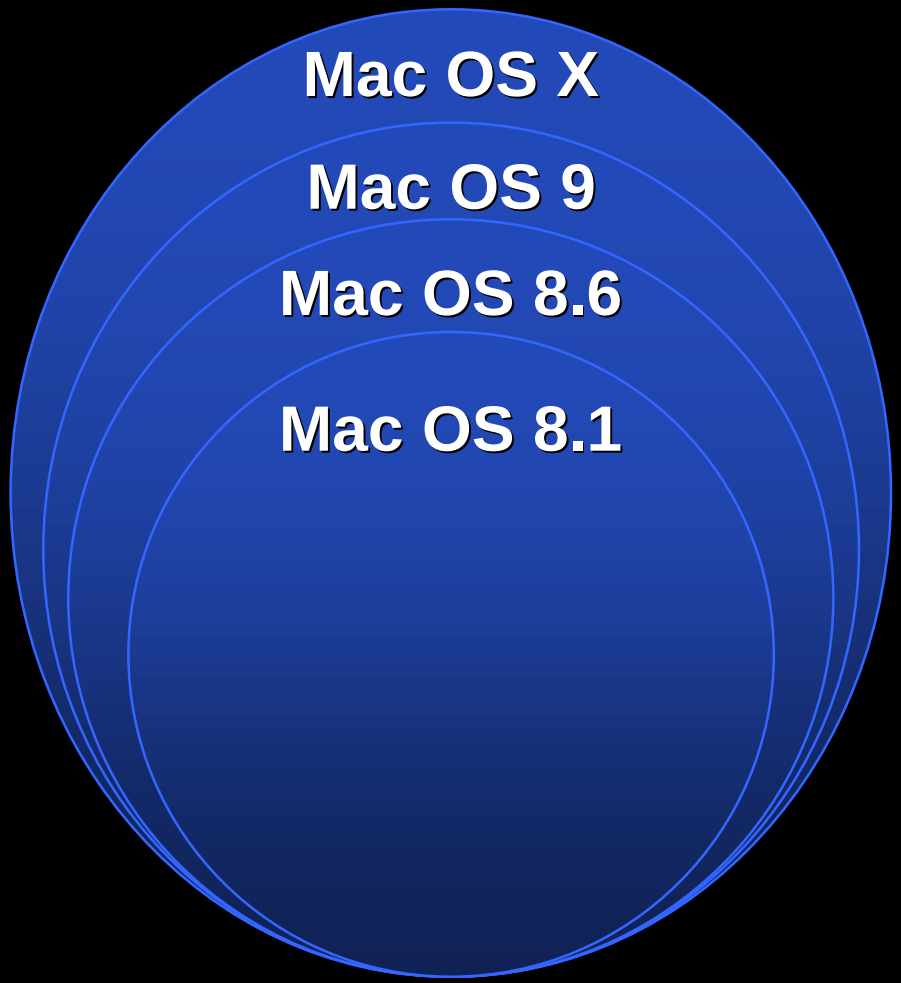
Test, Test, and Test!

- Each new CarbonLib is, in many ways, a new version of Mac OS 9
- When seeds are posted on ADC website, test immediately and report bugs ASAP (bugreport.apple.com)
- You don't want to discover that your app suddenly behaves incorrectly because Software Update delivered your customer a new CarbonLib
- Did I mention that you should test?

Future Directions



Going Forward



- Carbon is a living, growing API
- Each new release brings along all previous Carbon APIs
- Some new APIs are brought back to previous OS versions

What's Next?

- CarbonLib 1.4
  - New APIs
  - Improved application package support
  - Support for additional localizations
  - Currently seeded to ADC members
- Give feedback as soon as possible!

Feedback

For bugs and enhancements
http://bugreport.apple.com/

For non-technical feedback
carbon@apple.com

Support

Carbon Development Discussion List

http://lists.apple.com/mailman/listinfo/carbon-development/

Developer Technical Support

dts@apple.com

Roadmap

106 Carbon Event Manager	Hall 2 **Tues., 5:00pm**
112 Carbon: Windows & Menus	Hall 2 **Wed., 2:00pm**
114 Application Packaging & Document Binding	Hall 2 **Wed., 5:00pm**
FF114 Feedback Forum: High Level Toolbox	Room C **Fri., 3:30pm**

Who to Contact

Mark Turner
Carbon Technology Manager
Apple Worldwide Developer Relations
mark@apple.com

http://developer.apple.com/events/urls.html

Q&A

Mark Turner
Carbon Technology Manager
mark@apple.com

http://developer.apple.com/events/urls.html

WWDC
Worldwide Developers Conference 2001